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THE INTER-ARTICULAR LIGAMENT OF THE HEAD OF THE RIBS IN THE CAT.

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SYNONYMY.—1. Ligament interarticulaire.—*Bichat.* 2. Ligamentum teres.—*Gurlt and Schwab.* 3. Ligamentum conjugale costarum, and ligamentum teres.—*Meyer.* 4. Ligament interosseux ou interarticulaire.—*Rigot.* 5. Ligament articulaire.—*Chauveau.* 6. Ligamentum teres.—*Leyh.* 7. Ligamentum conjugale costarum.—*Cleland.* 8. Interarticular ligament.—*Human Anatomists.*

NOTE.—The works on papers in which these names are given are as follows:—BICHAT, XAV.—Traité d'Anatomie descriptive, 1801, tome I, p. 231. SCHWAB—Anatomie der Hausthiere, 1821. GURLT.—Vergleichende Anatomie der Hausthiere, 1822, und Anatomie des Pferdes, 1832. MEYER, A. F.—Ueber ein neuentdecktes Band, Jochband der Rippen. Muller's Archiv für Anatomie, Physiology, etc., 1834, s. 273. RIGOT.—Traité complet de l'Anatomie des Animaux domestique, 1840. CHAUVEAU, A.—Traité d'Anatomie comparée des Animaux domestiques. LEYH, A. F.—Handbuch der Anatomie der Hausthiere, etc. CLELAND, JOHN.—On the structure, actions and morphological relations of the ligamentum conjugale costarum. Edinburgh new Philosophical Journal, April, 1859.

STRUCTURE IN THE CAT.—In the domestic cat (*Felis domestica*), the heads of the ribs of the second to the eleventh pairs inclusive are united across the middle line of the body in the following way: Arising from about the middle of the head of the rib is a very strong and dense ligament, reminding one of the ligamentum teres of the femur. If the ligament be traced, it will be found to extend across the middle line of the body and attach itself to the head of the opposite rib. In its passage from one side of the body to the other, this ligament traverses the floor of the neural canal, resting in a groove formed on the dorsal aspect of the intervertebral cartilage. In its passage through the neural canal, it is roofed over by the posterior common ligament so that it is not visible until that is removed. Following Bichat, this ligament will be called *interarticular*, as it is without doubt only a modification of the interarticular ligament in man.

In order to study the structure and relations of this ligament in detail it is best to take one of the middle pairs of ribs, the sixth

pair for example, as its development and characteristics are most strongly marked in this region.

The articular part of the rib is pear-shaped, the small end pointing ventrad. Near the middle of this articular surface is a marked depression, as large proportionally as that in the head of the femur for the ligamentum teres. The main bundle of the interarticular ligament arises from this; but a moderately thin part arises from the head between the main part and the capsular ligament. This part is very closely connected to the capsular ligament, and seems to be an offset from it. The fibres of the ventral part of the interarticular ligament are at first directed nearly dorsad, and then extend toward the opposite rib.

In the groove on the dorsal side of the intervertebral cartilage, the ligament becomes flattened, and is attached by loose fibres to the posterior common ligament and by somewhat denser fibres to the intervertebral cartilage. The surface resting in the groove is free and smooth, and both it and the groove are lined by an extension of the synovial membrane of the heads of the two opposite ribs. It follows from this description that the joints of a pair of ribs are connected; and the two articular facets on the head of the same rib are in communication with each other, as each communicates with the groove for the interarticular ligament.

The *stellate ligament* is so attached to the head of the rib that it aids the interarticular ligament in dividing the head into two parts, corresponding to the articular facets for the two vertebræ to which it is joined. Many of the fibres of this stellate ligament pass across to the opposite rib, going beneath the anterior common ligament as the interarticular passes beneath the posterior common ligament. There is no groove, however, and the cross band is very intimately connected to the intervertebral fibro-cartilage.

Comparison with man. — If the interarticular ligament in the cat be compared to the homologous structure in man, a marked difference will be seen. In man the ligament is plate like, and joins the intervertebral fibro-cartilage without sending fibres across the middle line to the opposite rib. It also completely separates the two articular facets on the head of the rib, so that each is lined by an independent synovial membrane. In the cat, not only do the two facets of the same rib communicate with each other, but they communicate with the groove of the interarticular ligament, and through this groove, with the joint of the opposite rib. That is,

there is but one synovial cavity in the cat, and four in man, for a single pair of ribs.

Comparison with the lower mammals.—In comparing the cat's interarticular ligament with that of the lower mammals, it is found to differ from the seal in being but partly free, whereas in the seal it is entirely surrounded by synovial membrane (*Cleland*). In the horse, part of the ligament joins the intervertebral cartilage instead of all going across to the opposite rib as in the cat (*Meyer*).

In the woodchuck, some of the ribs have the ligament fully developed, and all of it crosses to the opposite side as in the cat, while with others, part of the ligament joins the intervertebral cartilage as in the horse.

Finally, in the musk rat the greater part of the fibres are attached to the intervertebral cartilage; but some of them pass across under the posterior common ligament to the opposite side. There is no groove developed, however, and the transverse fibres are very closely connected on all sides, as were the transverse fibres in the stellate ligament of the cat.

List of animals in which the interarticular ligament has been observed.—Man (*Bichat*). Monkey and rabbit, as in man (*Meyer*). Dog, cat, fox, wolf, bear, badger, horse, ox and pig[1] (*Meyer*). Sheep (*Chauveau*). Lion, otter, seal, weasel and squirrel (*Cleland*). Kangaroo, as in man (*Cleland*).

Leopard (*Felis leopardus*), mink (*Putorius lutreolus*), raccoon (*Procyon lotor*), musk rat (*Fiber zibethicus*), woodchuck (*Arctomys monax*) the author.

Functions.—The office of the interarticular ligament seems to be solely to hold the heads of the ribs in position. So strongly is it developed in the cat, that the head of the rib will often break before the ligament will give way.

The reason for the extension of the band across the middle line from rib to rib, seems to be, first, to give more freedom of motion to the ribs, and second, and most important, to avoid the strain upon the intervertebral fibro-cartilage that would result in violent inspiration if the ligament were attached directly to it as in man, rabbit, etc.

Prof. Meyer, in explaining the functions of the interarticular ligament, says that in animals like man and the rabbit, where the

[1] Dr. Cleland says "in the pig none of the fibres of the interarticular ligament are prolonged to the opposite side." In my own observations, I could find no fibres crossing from one side to the other. Is this peculiar to German pigs?

fibres do not pass from side to side, it serves merely to hold the head of the rib in the articular cavity. Where, however, it passes from the head of one rib to its fellow on the opposite side, it serves to hold the heads of the ribs in the same relative position, and to prevent the too great lateral expression in violent inspiration; and the generalization is made that its development is directly proportional to the amount of twisting (*Drehbewegung*) of which the spinal column is capable. It is evident from the position of the articular facet for the tuberosity of the rib, and the corresponding facet on the transverse process of the vertebra, that any structure tending to hold the head of the rib in position, would prevent lateral motion of the ribs beyond a certain degree. Where the ligament joins the heads of two opposite ribs, the strain is confined mostly to the ribs themselves, and does not involve the intervertebral fibro-cartilage as in animals where the ligament is attached directly to it.

His generalization, with reference to its proportional development in animals capable of a great deal of twisting of the spinal column, does not seem to hold; for it is very strongly developed in some, as for example the horse and ox, in which the movements of the spinal column are comparatively limited; and on the other hand it is absent as a cross band in the rabbit, and in monkeys. It certainly seems, if his generalization were correct, that a rabbit stands in greater need of the ligament than its near relative, the clumsy woodchuck.

One reason for preparing this paper was to correct the statement of Prof. Meyer, that in the cat only eight pairs of ribs (3–10 inclusive) possess this ligament. The fact is, with American cats at least, that the ligament is present in ten pairs (2–11 inclusive).

The more especial reason, however, was to call attention to the fact that Straus-Durckheim in his magnificent monograph of the *bones*, *ligaments* and *muscles* of the cat, published in 1845, nowhere mentions the existence of such a ligament. And in his figure of the ninth rib (plate XIII, fig. 17) the depression in the head of the rib for the attachment of the ligament is not shown.

This omission seems the more strange, as one, in nearly every instance, finds correct this retrospect placed on the title page of his great work—"I believe I have omitted nothing." The omission seems almost inexplicable also when it is considered, that Bichat had described the ligament in man, and Meyer and Rigot in animals, long before the work of Durckheim was published.

A New Method of demonstrating the Thoracic Duct in Animals. By S. H. Gage, of Ithaca, N. Y.

The thoracic duct or great lymphatic trunk which empties into the left subclavian vein may be demonstrated in three ways: —

1. The ordinary way, by feeding the animal with milk an hour or two before death.

2. By bleeding well, and then injecting the arterial system, while the animal is warm, with fine gelatin, colored with carmine or aniline. The lacteals and thoracic duct will, nearly always, be filled with the red gelatin.[1]

3. By feeding with milk as in the first case so that the receptaculum chyli may be easily found, and then injecting the duct from the receptacle with fine, colored plaster of paris. I am not aware that this method has been previously employed.

[1] This fact was first noted by Meckel, and reported by X. Bichat in the Anatomie générale, 1812, t. II, p. 581.

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